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construction innovation

NRC · CNRC

Read *Construction Innovation* on the Web at **http://irc.nrc-cnrc.gc.ca/newsletter**

Researchers conduct first series of road tunnel fire tests in Montreal

Few things would be more terrifying than being caught in traffic inside a tunnel when a fire breaks out. The smoke, the enclosed space and the need to escape could work together to cause even the calmest people stress. The smoke can also present a big problem for firefighters in terms of fighting the fire efficiently, and maintaining their own safety.

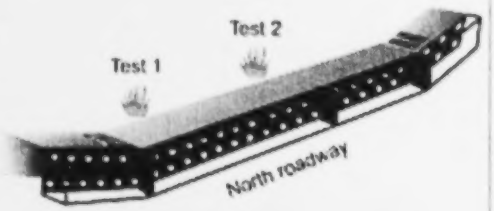
That's why researchers in IRC's Fire Risk Management Program are working with the Ministère des transports du Québec (MTQ) to investigate the ability of emergency ventilation strategies to control smoke spread in two expressway tunnels in Montreal. Using numerical modelling techniques, they hope to find ways to reduce the impact of smoke on tunnel users and to recommend guidelines for improving the performance of ventilation systems during firefighting operations.

"Numerical modelling is far less expensive and far less disruptive than full-scale tests," says Alexandre Debs, an engineer with the MTQ. "We can study many different fire scenarios, which we hope will help to optimize ventilation strategies and develop an intelligent operation system in the future to aid decision-making in emergency situations."

Under normal conditions, mechanical ventilation systems in tunnels provide users with comfortable temperature and humidity conditions, and maintain acceptable levels of air contaminants. If a fire occurs, the systems become even more important because they control smoke accumulation to ensure safe evacuation conditions and safe access for firefighters. Quick action minimizes the loss of life and property and reduces the time the tunnel is out of service.

IRC researchers are using both in situ experiments and numerical models based on Computational Fluid Dynamics (CFD) to conduct the study. These models break the tunnels down into hundreds of thousands of small cells that allow the researchers to predict in great detail the temperature, air velocity and smoke concentration at various points in the tunnel. This detailed information then allows them to evaluate the effectiveness of the emergency ventilation strategies.

Continued on page 4



Position of full-scale fire tests conducted in Montreal expressway tunnel

Researchers use propane burner to simulate a fire in Montreal's Louis-Hippolyte-La Fontaine Tunnel.

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Published by the Institute for Research in Construction, IRC

2007-03614/

IRC frames model national security code for buildings

The Institute for Research in Construction is in the process of developing a framework for a model national security code for the federal government. This code will provide design and construction requirements for new buildings and upgrades to owned or leased buildings, in an effort to make government-occupied buildings, their staff, assets, services and functions more secure from internal and external attacks involving the following:

- incendiary and explosive devices or materials
- mechanical force
- biological, reactive or radioactive substances
- projectile weapons, firearms and knives
- electromagnetic radiation and surveillance.

The types of government buildings that will be addressed by the proposed code still need to be confirmed, but are likely to include office buildings, embassies, immigration facilities at airports, customs buildings at border crossings, and service centres such as offices related to taxation, passports and employment.

The federal code will utilize the new objective-based format developed for the national model code documents. This format is expected to provide a high level of flexibility and ease in terms of being able to introduce technological innovation in the design of these buildings, which is necessary in a rapidly changing environment.

The code development process has been initiated with the assistance of a stakeholder committee that has representation from both private- and public-sector organizations. Key elements in this consensus process are the establishment of a roadmap for the code that will encompass:

a) the application (types of building and/or occupancy), scope (types of attacks/threats), objectives and structure of the code document;
b) the structure, number, membership, responsibilities and interactions of committees constituted to develop the code; and
c) approval procedures for the content of the code.

The primary sponsors of the work to date have been the RCMP and Public Works and Government Services Canada (PWGSC).

The next steps are to confirm sources of funding within the federal government for the writing of the code and to seek the involvement of experts in various aspects of security. It is anticipated that the code will take about five years to produce, with the drafting of the code expected to commence in 2004.

For more information, please contact Dr. Gerry Pernica at (613) 993-9750, fax (613) 954-5984, or e-mail gerry.pernica@nrc-cnrc.gc.ca.

National Building Code of Canada and National Fire Code of Canada now available on Special Edition CD-ROMs

The Institute for Research in Construction is pleased to announce the release of two new national code documents on Special Edition CD-ROMs:

- National Building Code of Canada 1995 (NBC), and
- National Fire Code of Canada 1995 (NFC).

The complete English and French versions of the documents are included on the CD-ROMs with a comprehensive list of bookmarks for easy access to content. Hyperlinks throughout each book facilitate cross-referencing so you can quickly retrieve all the related information you want. Acrobat Reader is all you need to take advantage of the improved search capabilities. The CD-ROMs are readable on Windows, Macintosh and Unix platforms.

All five series of revisions and errata are included in the National Building Code of Canada, and both series of revisions and errata are included in the National Fire Code of Canada.

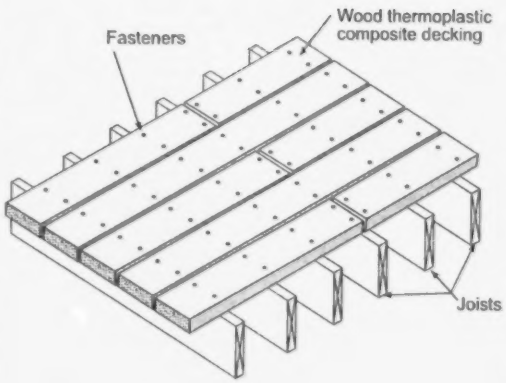
The NBC and NFC Special Edition CD-ROMs are available respectively for $179 and $125 (stand-alone installations).

Here's how to order:
Fill out the enclosed order form or contact our Publication Sales Department:
Tel.: (613) 993-2463 or 1 800 672-7990
Fax: (613) 952-7673
E-mail: IRC.Client-Services@nrc-cnrc.gc.ca

CCMC evaluates composite exterior decking and guards

More and more exterior decking and guard (railing) products made of composite extrusions are now being sold at local building material suppliers. These products are being used to build exterior balconies and decks in residential construction in lieu of traditional wood decking and guards.

The composite extrusions of these products may consist of a wood-blend-based material and plastic (e.g., polyethylene, polypropylene) or may be made of plastic material and cellulose-based fibres derived from wood residues or agricultural waste. While the wood or cellulosic fibre content of these composites varies among products, content (by weight) in the order of 50–60% is typical. Extrusions can be manufactured in solid or hollow cross-sections of various sizes and shapes. The nominal dimensions of many of these extrusions are similar to those of the sawn lumber traditionally used for the construction of exterior decks and guards.



Composite exterior decking evaluated by CCMC

As structural components, these composite decking and guard products must be capable of resisting the loads they will experience under normal use. They must also be capable of maintaining their structural capacity under the environmental loads that they will be exposed to over their service life, such as UV radiation, high and low temperatures, and moisture.

The structural design of products made of known materials, such as wood and steel, can be based on established material properties and calculation procedures. However, this is not the case for products that are made of non-traditional materials, such as these composite products, which do not have established physical and mechanical properties. But how can one be sure that these products are suitable for their intended use and that they conform to the intent of applicable building code requirements?

CCMC helps determine product suitability

To answer this question, CCMC has developed technical guides for evaluating exterior decking and guards composed of wood thermoplastic composite lumber (WTCL) of solid cross-section and of cellulosic/polymer composite extrusions of hollow cross-section. The guides were developed for the evaluation of products that contain less than 50% plastic (by weight).

The technical guides contain evaluation requirements related to the physical properties and degradation-resistant mechanisms of the composite material and to the structural performance of the decking and guards as installed. As it is impossible to produce evaluation protocols that would address all physical, mechanical and design characteristics of each proprietary product, the guides are modified as needed on a case-by-case basis to address the performance of each element and component of a product that CCMC is asked to evaluate.

One evaluation completed to date

The evaluation of one WTCL exterior decking product has now been completed. The evaluation report (CCMC 13125-R) for this product can be obtained by contacting CCMC directly or by going to http://irc.nrc-cnrc.gc.ca/ccmc. CCMC is presently working on the evaluation of other composite products intended for the construction of exterior decks and guards.

Specific questions can be directed to Gilles Poirier at (613) 993-6623, fax (613) 952-0268, or e-mail gilles.poirier@nrc-cnrc.gc.ca.

Registry of Product Evaluations

Now on the Web!

Updated quarterly

http://irc.nrc-cnrc.gc.ca/ccmc

Fire risk management

Researchers conduct first series of road tunnel fire tests in Montreal

Continued from cover page

To date, IRC researchers have completed an extensive literature review on motor tunnel ventilation for fire safety and selected two CFD models to use in the study based on this review. They have also conducted full-scale tests in the first of the two Montreal tunnels, the Louis-Hippolyte-La Fontaine Tunnel. This tunnel consists of two separate concrete tubes that run under the St. Lawrence River, with ventilation towers on both sides. It is part of the Trans-Canada Highway and a major part of Quebec's provincial road highway infrastructure, which meant that both planned tests had to take place in one night between midnight and 7 a.m. to keep traffic disruption to a minimum.

The researchers focused on the north roadway (see figure, p. 1) for the tests, conducting one in the middle of the tunnel and one close to the exhaust fans at the north end. Prior to the tests, they measured airflow and established ventilation scenarios. They also developed a clean-burning propane burner system that produces no smoke (see photo, p. 1). This system is a compact, portable, convenient heat source that is capable of producing up to 5 MW of heat output, which would simulate a small car fire. Artificial smoke was used to create realistic visual effects.

Six two-person teams took temperature and optical smoke-density measurements at 60 locations upstream and 20 locations downstream of the fire. They also measured the air speed at the two portals, mid-tunnel, exhaust fans, and inside the evacuation paths located between the two roadways. The ceiling temperature reached approximately 50°C during the tests, far below the 100°C threshold recommended to minimize potential damage to tunnel and testing equipment.

The results of the fire tests are now being used to verify the results of the CFD models. Initial results indicate that there is good comparison between the models and the two test scenarios. In addition, based on visual observations during the tests, the smoke moved in the direction it was supposed to move in all fire scenarios. A second series of fire tests is planned for the fall of 2004 in Montreal's Ville-Marie Tunnel.

The research team involved in this study is multidisciplinary with extensive experience in fluid engineering and smoke management, both theoretical and experimental. Specific questions on this project can be directed to Dr. Ahmed Kashef at (613) 990-0646, fax (613) 954-0483, e-mail ahmed.kashef@nrc-cnrc.gc.ca; further information can be found at http://irc.nrc-cnrc.gc.ca/frm/smoketunnels.html.

Newsbrief

FiRECAM™— a tool that can assess fire-safety performance of apartment buildings

IRC has just released the first beta version of its fire risk assessment software, FiRECAM™, for testing and evaluation by the fire, regulatory, design and engineering communities (see *Construction Innovation* at http://irc.nrc-cnrc.gc.ca/newsletter/v5no1/community_e.html).

FiRECAM™, which stands for Fire Risk Evaluation and Cost Assessment Model, is a Windows-based computer program developed in partnership with the Department of National Defence and Public Works and Government Services Canada (PWGSC). It is a software tool that can be used by fire-protetion engineers to assess the level of fire safety that a particular design can provide to the occupants of an apartment building.

This engineering tool can support the comparison of alternative fire-protection system designs to a code-compliant design in terms of the safety it provides. As well, the software can indicate the associated costs—capital and maintenance—of the fire-protection system and the expected fire losses, allowing designers to identify cost-effective designs that provide the required level of safety. Discussions are underway with PWGSC regarding the future release of a beta version of the FiRECAM™ office model.

To download the beta version of FiRECAM™ go to http://irc.nrc-cnrc.gc.ca/frm/risk/firecam/index.html. If you would like to comment on or make suggestions on how to improve the software, please contact Dr. Noureddine Bénichou at (613) 993-7229, fax (613) 954-0483, or e-mail noureddine.benichou@nrc-cnrc.gc.ca.

SiF 2004
Workshop for fire resistance experts to be held in Ottawa

A workshop organized by the National Research Council that brings together experts in fire-resistance research from around the world will be held in Ottawa on **May 10 and 11, 2004**. The focus of the Third International Workshop on Structures in Fire, SiF 2004, will be on determining the behaviour of structures exposed to fire by various means—testing, calculation and numerical modelling. Topics to be addressed include the behaviour of materials, systems, and buildings and structures, when exposed to fire.

For more information:
Web site: http://irc.nrc-cnrc.gc.ca/frm/SiF2004

Lightswitch Wizard provides reliable daylight simulations for design investigation

To foster the use of daylighting concepts throughout the design of a building, the Lighting Group at IRC, in partnership with the Buildings Group at Natural Resources Canada, has developed an online support service called Lightswitch Wizard (at www.buildwiz.com/lightswitch/). The Wizard can help building designers to design perimeter offices with "enough but not too much" annual daylight and lighting designers to assess the energy of lighting and window blind controls.

The need for design tools to assess daylighting

In a rapidly changing world, design professionals rely more than ever on solid performance measures to support their design decisions. The role of computerized building design tools is to provide such information efficiently. Given the breadth of choices and concerns that a design team is confronted with, various aspects of the design often compete for the team's attention. In today's competitive environment, the value of information gained through any one simulation tool must constantly be weighed against the time it takes and the financial resources that are required, as well as against the value of the information that might be gained through the use of other or no tools.

Because daylighting is such an important design feature of virtually all sustainable buildings and because it is so difficult to evaluate its quality and quantity in a space through simple rules of thumb, there is a need for daylighting software with a high rate of acceptance and adoption within the market.

How Lightswitch Wizard addresses designers' needs

Lightswitch Wizard users do not need to have any previous knowledge of daylight simulation techniques, as all simulation inputs are explained in the online technical background and the glossary sections. An online simulation typically takes between 20 seconds and three minutes, assuming moderate traffic on the server and a fast Internet connection.

Simulation results are based on IRC's expert software DAYSIM (at http://irc.nrc-cnrc.gc.ca/ie/light/daysim.html), which has been coupled with an empirical model that mimics manual lighting and blind control in offices. The model is based on field data collected in real buildings. It offers a comparative, reliable, and quick analysis of the annual amount of daylight available in peripheral private offices and the lighting energy performance of automated lighting controls (occupancy sensors, photocells) relative to that of standard on/off switches. Blinds can be either manually or automatically controlled.

Between June and December 2003, 1700 people used the Wizard online, indicating great interest. Now the developers of the software are trying to further increase the number of users who integrate the service into their design routine. A follow-up project funded by BC Hydro, the Technology & Innovation Initiative on Climate Change, Natural Resources Canada, and NRC will include classrooms as a new "building" type and link the output of the Wizard to the LEED daylighting credits. (LEED is a green building rating system from the U.S. Green Building Council.)

Specific questions can be directed to Dr. Christoph Reinhart at (613) 993-9703, fax (613) 954-3733, or e-mail christoph.reinhart@nrc-cnrc.gc.ca.

Building Science Insight
Seminar Series–2004 NRC·CNRC

Building a Better Cubicle: Cost-Effective Office Design

How can open-plan office space be designed to be truly cost-effective?

Truly cost-effective office design needs to take into consideration the cost of materials, floor space and labour—poor environments that hinder employees from doing their work are not cost-effective.

BSI 2004 will address how open-plan office design factors—acoustics, lighting, air quality, privacy—affect the workplace environment, and occupant satisfaction with this environment. Ergonomic issues relevant to open-plan offices will also be covered. The linkages between workplace satisfaction, job satisfaction and organizational productivity will be presented.

If you would like more information about this seminar, please contact Monique Myre at (613) 993-0435, fax (613) 952-7673, or e-mail monique.myre@nrc-cnrc.gc.ca.

Expert feedback sought to improve prediction of corrosion in water mains

Researchers in IRC's Urban Infrastructure Rehabilitation (UIR) program have developed a model to predict the deterioration of ductile and cast-iron water mains. They are now seeking support from the water industry to validate and improve the model. This support can come in two ways: feedback from experts in the water industry and/or field data from practitioners and pipe owners. The model will serve as a tool that can help lower maintenance and repair costs for municipalities and ensure a sustainable water transmission and distribution system.

Several factors contribute to the structural failure of ductile and cast-iron water mains, the most important of which is corrosion. If municipalities were able to identify environments in which corrosion was most likely to occur, they could work proactively to prevent failures by installing externally coated pipes or providing cathodic protection for them. Furthermore, they could prioritize pipes for condition assessment programs, thus avoiding the cost of inspecting pipes that are at a lower risk of deterioration.

The current method of predicting corrosion

The most common method for predicting corrosion is based on soil properties. Using "The 10-point scoring method," published by the American Water Works Association, soil properties (such as resistivity and pH) are evaluated for their contribution toward corrosivity. If the total score is more than 10, the soil is considered corrosive to ductile and cast-iron water mains, and those water mains are flagged for protection.

This method, however, cannot quantify the intensity of soil corrosivity nor can it deal with uncertainties associated with imprecise and incomplete information on the soil properties.

IRC's corrosion model

IRC's corrosion model is designed to identify problem areas with greater ease and accuracy. The model is based on a fuzzy logic expert system, which evolves over time by incorporating expert opinion and field data.

Currently, the knowledge base contains information gleaned from research literature on the corrosion of ductile and cast-iron water mains. The next step is to augment the information in the knowledge base by adding experience and field data from corrosion experts, water utility managers, municipal engineers and others with pertinent information. The addition of this information will enhance the performance of the expert system and help municipalities make better-informed decisions about the protection and renewal of their metallic water mains.

Online survey available

IRC researchers have posted an online survey at ftp://contact.irc.nrc.ca/pub/corrosivity/survey.pdf to help gather the required information in a convenient way. Field data (such as corrosion measurements from exhumed pipes, soil properties and GIS data) that experts are willing to share can be submitted at the end of the survey.

For more information on this project, or to explore possibilities for collaboration, contact Dr. Homayoun Najjaran at (613) 993-3806, fax (613) 952-8102, or e-mail homayoun.najjaran@nrc-cnrc.gc.ca.

Newsbrief

Turning wastes into building materials

What should be done with industrial and mining waste? In many cases, high-tech solutions to the problem are too expensive or complex to consider, which is why industry often chooses the low-tech options: stockpiling and dumping. This has been the case for many years, but nowadays these solutions are not viable, for both economic and environmental reasons.

Worldwide, industry generates millions of tons of solid waste. One power station produces mountains of ash each year, and finding a way to deal with its disposal has become a high priority.

Researchers in IRC's Building Envelope and Structure Program are working on methods for reducing these wastes, looking at solutions that will suit both waste producers and those in the construction sector. To this end, they have initiated a new research project to develop waste-based construction materials. The research focuses on the conversion of industrial wastes, such as fly ash, slag, bauxite, cement kiln dust, red mud and natural products—for example, clays—into inorganic polymers. Such materials, known as geopolymers, are produced by activating a mixture containing silicon and aluminum with alkali metals at room temperature and atmospheric pressure.

Although these new materials are currently aimed at applications for which ordinary concrete is not suitable, it is important to emphasize that their production process is environmentally friendly—this process produces a minimum of greenhouse gas (because it generates 80% less CO_2 than conventional Portland cement) and energy in comparison with the manufacture of conventional materials, and provides a practical new way to reduce global warming.

IRC is currently discussing the possibility of exploiting this new technology with two different companies, and is seeking other partners. If you are interested in joining this project, please contact Dr. Laila Raki at (613) 991-2612, fax (613) 954-5984, or e-mail laila.raki@nrc-cnrc.gc.ca.

IRC Strategic Plan responds to industry needs

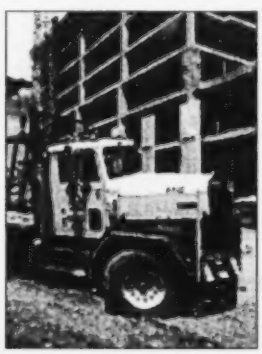
Strategic planning was a priority for IRC in 2003. The result? Recognition that the construction industry is going through the transition into the knowledge-based economy, and that IRC can help enable that transition.

Beginning with a major scan of societal, political and environmental issues that can affect the sector, IRC undertook the development of a new five-year strategic plan that will respond to the needs of its major stakeholders. An expert panel made up of industry practitioners and academics vetted an in-depth review of emerging technologies that could be of benefit not only to product and equipment suppliers but also to designers and decision-makers. Consultation forums in Halifax, Montreal, Toronto and Calgary highlighted the real issues faced by the construction sector today.

By re-aligning its current research focus to develop the knowledge and technologies essential to the creation of a high-quality and cost-effective built environment, IRC will initiate new projects that will assist industry in meeting the challenges of climate change, sustainable development and indoor health. It also plans to develop integrated decision-making tools that will enable the construction sector to respond to society's changing performance expectations, while mitigating the risks associated with the introduction of new practices and technologies. IRC's multidisciplinary approach will serve it well in creating several IRC-wide activities to tackle the issues most important to the construction sector.

The Strategic Plan has been approved by IRC's external Advisory Board and by the NRC Governing Council. It will be implemented starting in April 2004, and will be reflected in all IRC activities.

You will hear more in future issues of *Construction Innovation*.



What we're hearing

IRC's publications now listed in ICONDA

IRC's publications have recently been added to the world's premier database for building information, ICONDA (the International **Con**struction **Da**tabase). ICONDA contains technical literature on subjects related to civil engineering, urban and regional planning, architecture and construction from organizations in 20 countries.

In the database, there are over half a million references from sources such as periodicals, books, business and research reports, conference proceedings and theses, making ICONDA an invaluable source of information for researchers and construction industry professionals seeking the latest in building science and technology.

The addition of IRC publications to ICONDA provides greater international exposure for the Institute's expertise and enhances IRC's position as a world leader in the provision of construction technology information. ICONDA is published by Fraunhofer Information Center for Regional Planning and Building Construction in Germany and is sponsored by the International Council for Research and Innovation in Building and Construction (CIB) and the International Union of Building Centres (UICB).

The database can be searched at http://www.irbdirekt.de/iconda/. IRC publications can still be directly accessed at http://irc.nrc-cnrc.gc.ca/ircpubs/.

Join us at CIB2004 in Toronto this May!

Register online at www.cib2004.ca

Construction researchers, practitioners and managers should mark their calendars for May 2-7, 2004, when the ***CIB World Building Congress*** will be held in Toronto.

The International Council for Research and Innovation in Building and Construction, or CIB, is an international research organization comprising member researchers and research organizations from around the world, each with a strong history of developing construction technology and encouraging innovation. The CIB congress is held every three years and presents a rare opportunity for leaders of the construction industry to rub shoulders with some of the brightest minds in construction research from around the globe.

"We are witnessing rapid changes in construction technologies, processes and procurement worldwide and some truly innovative approaches are emerging to help deal with the attendant needs and challenges," said Dr. Sherif Barakat. "CIB2004 will bring the best of these to the attention of researchers and decision-makers in the construction industry and we expect a spirited exchange of information and opinion."

Making the 2004 congress even more attractive is the fact that two other major conferences are being held with it. The 5th International Conference on Indoor Air Quality, Ventilation and Energy Conservation in Buildings, and the 6th International Conference on Multi-Purpose Highrise Towers and Tall Buildings will combine with CIB to deliver an unprecedented event. The combined event is billed as CIB2004.

CIB's current president is Dr. Sherif Barakat, Director General of the Institute for Research in Construction, a division of the National Research Council of Canada.

"We are witnessing rapid changes in construction technologies, processes and procurement worldwide and some truly innovative approaches are emerging to help deal with the attendant needs and challenges," said Dr. Barakat. "CIB2004 will bring the best of these to the attention of researchers and decision-makers in the construction industry and we expect a spirited exchange of information and opinion."

With the continuing repercussions from 9/11, attendees will hear some excellent presentations dealing with security issues, fire-safety design, evacuation of buildings, and changes in regulation. Converging with safety and security is the issue of indoor air quality and comfort. The ventilation conference will present key advances in ventilation strategies, material emissions research, energy efficiency, and some interesting developments involving psychological aspects of occupant comfort, satisfaction and productivity in the workplace.

"Building performance, safety, security and comfort are all on the minds of developers, designers, manufacturers and building managers today," said Dr. Barakat. "The research community is working hard to help industry meet new standards of excellence and more stringent requirements regarding environmental protection, sustainability and energy efficiency."

Changes in the construction process, improvements in procurement and performance-based design, along with efforts to enhance construction productivity, will also be featured.

The congress will be held at The Westin Harbour Castle hotel, located in the heart of Toronto, one of the great cities of North America. Attendees will have ample time to enjoy the city's exciting sights and sounds. Special tours in and around the city are planned.

For more information, please visit our Web site at www.cib2004.ca. A registration form is attached for your convenience.

CIB World Building Congress 2004, May 2–7
REGISTRATION FORM

Note: All functions will be held at The Westin Harbour Castle

Please complete and return this registration form by fax to **1-613-952-7673**, or by mail to: →

Ms. Monique Myre, Conference Secretariat
Institute for Research in Construction (IRC)
National Research Council Canada (NRC)
1200 Montreal Road, Building M-20, Ottawa, ON K1A 0R6 Canada
Tel: 1-613-993-0435 Fax: 1-613-952-7673 E-mail: cib2004@nrc.ca

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CONFERENCE FEE & PAYMENT – All fees are in Canadian dollars

❒ Early full registration (before March 15, 2004)	$1050.00	$ _____
❒ CIB members full registration (before March 15, 2004)	$975.00	$ _____
❒ Students (before March 15, 2004)	$550.00	$ _____
❒ Full registration	$1175.00	$ _____
❒ Students	$650.00	$ _____
❒ Additional banquet ticket(s): # of tickets _____	@$100.00 each	$ _____
❒ Day registration (date(s)) _____ # of days _____ (Does not include social functions)	@$350.00 per day	$ _____
Total registration fees due		$ _____

I will take part in the official conference banquet (included in full registration fee) on May 5 at The Westin Harbour Castle (Metro Centre Ballroom) ❒ Yes ❒ No

Please refer to www.CIB2004.ca/registration.html for information on cancellations, etc.

❒ Cheque enclosed (made payable to Receiver General for Canada) ❒ Visa ❒ MasterCard ❒ American Express

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Card number Expiration date (mm/dd)

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Signature Print name

Continuing Education Credits/Units

This conference offers engineering professionals and technicians an opportunity to earn Continuing Education Units (CEU), which are recognized nationally as a measure of continuing competency. I authorize NRC/IRC to transfer my CEU records to the Engineering Institute of Canada's official registry.

X_____
Signature

WBS 44-CIB04-R-4

See next page for accommodation

ACCOMMODATION

Reservation requests will be handled on a first-come first-served basis and must be submitted to NRC/IRC. A one-night deposit is required for each room reservation. Cancellations are subject to The Westin Harbour Castle cancellation policies.

Confirmations will be sent directly from NRC. All room rates are in Canadian dollars and are exclusive of taxes.

The Westin Harbour Castle, One Harbour Square, Toronto

Moderate guest room

❒ $239.00 (Based on single/double occupancy)

- ❒ Single (one person)
- ❒ Double (two persons – one king-size bed)
- ❒ Double (two persons – two double beds)

$30.00 for each additional adult sharing the room (max. 4 per room).

❒ **Smoking** ❒ **Non smoking** (Subject to availability)

Hotel arrival date: _____ **Time:** _____

Hotel departure date: _____ **Time:** _____

X _____

Name of person(s) sharing the above room

Additional payment for hotel deposit (please check appropriate method)

❒ Cheque enclosed (make payable to The Westin Harbour Castle)

❒ Same card number as used for payment of conference

❒ VISA ❒ MasterCard ❒ American Express

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Card number Expiration date (mm/dd)

X _____ _____

Signature Print name

ROOMS WILL NOT BE AVAILABLE FOR OCCUPANCY UNTIL AFTER 15:00. Luggage storage is available. Check-out time is 12:00.

For more information please visit:

www.cib2004.ca

Please fax completed registration form to:
1-613-952-7673

National Research Council Canada
Institute for Research in Construction

Conseil national de recherches Canada
Institut de recherche en construction

CONSTRUCTION CODES ORDER FORM

DOCUMENT*	PRINTED COPY				CD-ROM FORMAT				
						STAND ALONE	NETWORK PACKS		
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					Specify Quantity ⇨				
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National Plumbing Code 1995	*$59*		*$54*			*$89*	*$178*	*$356*	*$534*
User's Guide on the National Plumbing Code	*n/a*		*$47*			*$85*	*$170*	*$341*	*$511*
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Upcoming events

APRIL

4-5
Canadian Commission on Building and Fire Codes Victoria. Contact: John Archer at (613) 993-55[illegible] e-mail: john.archer@nrc-cnrc.gc.ca

MAY

2-7
CIB World Building Congress 2004. Toronto. www.cib2004.ca. See this issue, p. 8 for more information about the congress and the registration form.

7-8
CIB W78 Information Technology in Construction, Annual Workshop. Integrated Systems to Support Sustainability. Toronto. http://www.civ.utoronto.ca/sect/coneng/i2c/General/w78.doc

10-11
SiF 2004. Third International Workshop on Structures in Fire. Ottawa. http://irc.nrc-cnrc.gc.ca/frm/SiF2004

16-19
Cold Regions Engineering & Construction Conference & Expo 2004. Edmonton. http://www.iwcse.com/

27-28
World of Construction Project Management—WCPM 2004. Toronto. www.ryerson.ca/~wcpm2004

JUNE

13-16
The 17th Engineering Mechanics Conference of the American Society of Civil Engineers. University of Delaware, Newark, DE. http://chinacat.coastal.udel.edu/EM2004/

JULY

4-7
13th International Brick and Block Masonry Conference. Amsterdam. http://www.13-ibmac.bwk.tue.nl

13-16
7th Australasian Masonry Conference. Newcastle, Australia. http://www.eng.newcastle.edu.au/eng/7amc

25-28
28th International Air Transport Conference. Washington, DC. http://www.asce.org/conferences/iatc2004/

28
AWWA Seminar. Continuous Water Quality Monitoring. Toronto. http://www.awwa.org/education/seminars/

27-31
Geo-Trans 2004. Los Angeles. http://www.asce.org/conferences/geotrans04/

AUGUST

1-4
ASCE International Conference 2004. Pipeline Engineering & Construction. San Diego. http://www.asce.org/conferences/pipelines2004/

1-6
13th World Conference on Earthquake Engineering. Vancouver. www.13WCEE.com

29-Sept 2
Anaerobic Digestion—10th World Congress. Montreal. http://www.ad2004montreal.org/

SEPTEMBER

12-15
APWA International Public Works Congress and Exposition. Atlanta. http://www.apwa.net/Meetings/Congress/2004/

This calendar does not include all events scheduled to take place during this time frame. For a more complete listing, see the Web version of "Upcoming events" at http://irc.nrc-cnrc.gc.ca/events.html

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